

SEQUENCE LISTING

<110> F. HOFFMANN-LA ROCHE AG

<120> Cytochrome c oxidase and its genes

<130> 20511 EP

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<150> 99.122842.0

<151> 1999-11-17

<160> 18

<170> PatentIn Ver. 2.0

<210> 1

<211> 1674

<212> DNA

<213> Gluconobacter oxydans

<220>

<221> CDS

<222> (1)..(1674)

<400> 1

atg gca gac gcc gcc att cac ggc cat gac cac cat gag aag caa ggc
48

Met Ala Asp Ala Ala Ile His Gly His Asp His His Glu Lys Gln Gly
1 5 10 15

ttc ttc acg cgc tgg ttc atg tcg acc aac cac aaa gac atc ggt ctg
96

Phe Phe Thr Arg Trp Phe Met Ser Thr Asn His Lys Asp Ile Gly Leu
20 25 30

cta tac ctt gta gcg gct ggt gtt gtt ggt ttc att tcc gtc ctg ttc 1
44

Leu Tyr Leu Val Ala Ala Gly Val Val Gly Phe Ile Ser Val Leu Phe

35

40

45

acc gtc tac atg cgc ctt gag ctg atg gat ccg ggt gtt cag tac atg 1
92

Thr Val Tyr Met Arg Leu Glu Leu Met Asp Pro Gly Val Gln Tyr Met
50 55 60

tgc ctt gaa ggc gca cgt ctg atc gcg gat gcc tcg cag aca tgt acg 2
40

Cys Leu Glu Gly Ala Arg Leu Ile Ala Asp Ala Ser Gln Thr Cys Thr
65 70 75 80

gcg aac gga cac ctg tgg aac gtc atg gtt acc tac cat ggt att ctg 2
88

Ala Asn Gly His Leu Trp Asn Val Met Val Thr Tyr His Gly Ile Leu
85 90 95

atg atg ttc ttt gtg ggt atc ccc gca ttg ttc ggt ggt ttt ggt aac 3
36

Met Met Phe Phe Val Gly Ile Pro Ala Leu Phe Gly Gly Phe Gly Asn
100 105 110

tat ctg atg ccg ctg caa atc ggc gct ccg gat atg gcc ttc ccg cgt 3
84

Tyr Leu Met Pro Leu Gln Ile Gly Ala Pro Asp Met Ala Phe Pro Arg
115 120 125

atg aac aac ctg tcg ttc tgg ctg ttc att gcc ggt acc gcg atg ggc 4
32

Met Asn Asn Leu Ser Phe Trp Leu Phe Ile Ala Gly Thr Ala Met Gly
130 135 140

gtg gct tcg ctg ttc gca ccg ggc ggt gac ggt cag ctg ggt tcg ggc 4
80

Val Ala Ser Leu Phe Ala Pro Gly Gly Asp Gly Gln Leu Gly Ser Gly
145 150 155 160

gtt ggt tgg gtt ctg tac ccg ccg ctg tcg acc cgc gaa gct ggc tat 5
28

Val Gly Trp Val Leu Tyr Pro Pro Leu Ser Thr Arg Glu Ala Gly Tyr
165 170 175

tcg atg gac ctc gcg att ttc gcg gtt cac ttg tcg ggt gcc tcc tcg 5

76

Ser Met Asp Leu Ala Ile Phe Ala Val His Leu Ser Gly Ala Ser Ser
 180 185 190

atc atg ggc gcg atc aac atg atc acg acc ttc ttg aac atg cgc gcc 6
 24

Ile Met Gly Ala Ile Asn Met Ile Thr Thr Phe Leu Asn Met Arg Ala
 195 200 205

ccc ggc atg acg ctg cac aaa gtg ccg ttg ttc tcg tgg tcg atc ttt 6
 72

Pro Gly Met Thr Leu His Lys Val Pro Leu Phe Ser Trp Ser Ile Phe
 210 215 220

atc acg gct tgg ctg atc ctg ctg gcg ctg ccg gtt ctg gct ggt gca 7
 20

Ile Thr Ala Trp Leu Ile Leu Leu Ala Leu Pro Val Leu Ala Gly Ala
 225 230 235 240

atc acc atg ctg ctg acc gac cgt aac ttc ggc acg acc ttc ttc aat 7
 68

Ile Thr Met Leu Leu Thr Asp Arg Asn Phe Gly Thr Thr Phe Phe Asn
 245 250 255

cct gct ggc ggc ggt gac ccg att ctg tac caa cac atc ctg tgg ttc 8
 16

Pro Ala Gly Gly Gly Asp Pro Ile Leu Tyr Gln His Ile Leu Trp Phe
 260 265 270

ttt ggg cac ccg gaa gtg tac atc atc att ctg ccc ggc ttt ggc atc 8
 64

Phe Gly His Pro Glu Val Tyr Ile Ile Ile Leu Pro Gly Phe Gly Ile
 275 280 285

atc agc cat gtc gtg tcg acc ttc tcg aaa aag ccg gtc ttc ggt tac 9
 12

Ile Ser His Val Val Ser Thr Phe Ser Lys Lys Pro Val Phe Gly Tyr
 290 295 300

ctg ccg atg gtc tat gca atg gtg gca atc ggt gtt ctg ggc ttt gtc 9
 60

Leu Pro Met Val Tyr Ala Met Val Ala Ile Gly Val Leu Gly Phe Val
 305 310 315 320

gtc tgg gcg cac cac atg tac acc gtt ggt atg tcg ctg acc cag caa 10
08

Val Trp Ala His His Met Tyr Thr Val Gly Met Ser Leu Thr Gln Gln
325 330 335

tcc tac ttc atg ctg gcc acc atg gtg atc gcg gtg ccg acc ggc att 10
56

Ser Tyr Phe Met Leu Ala Thr Met Val Ile Ala Val Pro Thr Gly Ile
340 345 350

aag atc ttc tcg tgg atc gcc acg atg tgg ggc ggc tcg gtt gag ttc 11
04

Lys Ile Phe Ser Trp Ile Ala Thr Met Trp Gly Gly Ser Val Glu Phe
355 360 365

aaa tcg ccg atg ctc tgg gcc ttt ggc ttt atg ttc ctg ttc acc gtg 11
52

Lys Ser Pro Met Leu Trp Ala Phe Gly Phe Met Phe Leu Phe Thr Val
370 375 380

ggt ggt gtg acc ggt atc gtg ctg gcc caa gcg ggt ctg gac cgt gca 12
00

Gly Gly Val Thr Gly Ile Val Leu Ala Gln Ala Gly Leu Asp Arg Ala
385 390 395 400

tat cac gac acc tat tac gtg gtg gcg cac ttc cat tat gtg atg tcg 12
48

Tyr His Asp Thr Tyr Tyr Val Val Ala His Phe His Tyr Val Met Ser
405 410 415

ctg ggt gcg atc ttt gcg atc ttc gcc ggt atc tac ttt tac atg ccg 12
96

Leu Gly Ala Ile Phe Ala Ile Phe Ala Gly Ile Tyr Phe Tyr Met Pro
420 425 430

aag ttc tcg ggc cgc gct ttc ccg gaa tgg gct gca aag ctg cac ttc 13
44

Lys Phe Ser Gly Arg Ala Phe Pro Glu Trp Ala Ala Lys Leu His Phe
435 440 445

tgg acc ttc ttc atc ggt gcg aac gtc acg ttc ttc ccg cag cac ttc 13
92

Trp Thr Phe Phe Ile Gly Ala Asn Val Thr Phe Phe Pro Gln His Phe

460

Leu Gly Arg Gln Gly Met Pro Arg Arg Tyr Ile Asp Tyr Pro Glu Ala
465 470 475 480

Phe Ala Leu Trp Asn Lys Val Ser Ser Tyr Gly Ala Phe Leu Ala Phe
485 490 495

Ala Ser Phe Leu Phe Phe Ile Val Ile Phe Val Tyr Thr Leu Val Ala
500 505 510

Gly Arg Arg Glu Thr Arg Pro Asn Pro Trp Gly Glu Phe Ala Asp Thr
515 520 525

Leu Glu Trp Thr Leu Pro Ser Pro Pro Pro Ala His Thr Phe Glu Thr
530 535 540

Leu Pro Lys Arg Ser Asp Trp Asp Lys His Pro Ser His
545 550 555

<213> Gluconobacter oxydans

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 20 25 30
 Leu Tyr Leu Val Ala Ala Gly Val Val Gly Phe Ile Ser Val Leu Phe
 35 40 45
 Thr Val Tyr Met Arg Leu Glu Leu Met Asp Pro Gly Val Gln Tyr Met
 50 55 60
 Cys Leu Glu Gly Ala Arg Leu Ile Ala Asp Ala Ser Gln Thr Cys Thr
 65 70 75 80
 Ala Asn Gly His Leu Trp Asn Val Met Val Thr Tyr His Gly Ile Leu
 85 90 95
 Met Met Phe Phe Val Gly Ile Pro Ala Leu Phe Gly Gly Phe Gly Asn
 100 105 110
 Tyr Leu Met Pro Leu Gln Ile Gly Ala Pro Asp Met Ala Phe Pro Arg
 115 120 125
 Met Asn Asn Leu Ser Phe Trp Leu Phe Ile Ala Gly Thr Ala Met Gly
 130 135 140
 Val Ala Ser Leu Phe Ala Pro Gly Gly Asp Gly Gln Leu Gly Ser Gly
 145 150 155 160
 Val Gly Trp Val Leu Tyr Pro Pro Leu Ser Thr Arg Glu Ala Gly Tyr
 165 170 175
 Ser Met Asp Leu Ala Ile Phe Ala Val His Leu Ser Gly Ala Ser Ser
 180 185 190
 Ile Met Gly Ala Ile Asn Met Ile Thr Thr Phe Leu Asn Met Arg Ala
 195 200 205
 Pro Gly Met Thr Leu His Lys Val Pro Leu Phe Ser Trp Ser Ile Phe
 210 215 220
 Ile Thr Ala Trp Leu Ile Leu Leu Ala Leu Pro Val Leu Ala Gly Ala
 225 230 235 240
 Ile Thr Met Leu Leu Thr Asp Arg Asn Phe Gly Thr Thr Phe Phe Asn
 245 250 255
 Pro Ala Gly Gly Gly Asp Pro Ile Leu Tyr Gln His Ile Leu Trp Phe
 260 265 270
 Phe Gly His Pro Glu Val Tyr Ile Ile Ile Leu Pro Gly Phe Gly Ile
 275 280 285
 Ile Ser His Val Val Ser Thr Phe Ser Lys Lys Pro Val Phe Gly Tyr
 290 295 300
 Leu Pro Met Val Tyr Ala Met Val Ala Ile Gly Val Leu Gly Phe Val
 305 310 315 320
 Val Trp Ala His His Met Tyr Thr Val Gly Met Ser Leu Thr Gln Gln
 325 330 335
 Ser Tyr Phe Met Leu Ala Thr Met Val Ile Ala Val Pro Thr Gly Ile
 340 345 350
 Lys Ile Phe Ser Trp Ile Ala Thr Met Trp Gly Gly Ser Val Glu Phe

355 360 365
 Lys Ser Pro Met Leu Trp Ala Phe Gly Phe Met Phe Leu Phe Thr Val
 370 375 380
 Gly Gly Val Thr Gly Ile Val Leu Ala Gln Ala Gly Leu Asp Arg Ala
 385 390 395 400
 Tyr His Asp Thr Tyr Tyr Val Val Ala His Phe His Tyr Val Met Ser
 405 410 415
 Leu Gly Ala Ile Phe Ala Ile Phe Ala Gly Ile Tyr Phe Tyr Met Pro
 420 425 430
 Lys Phe Ser Gly Arg Ala Phe Pro Glu Trp Ala Ala Lys Leu His Phe
 435 440 445
 Trp Thr Phe Phe Ile Gly Ala Asn Val Thr Phe Phe Pro Gln His Phe
 450 455 460
 Leu Gly Arg Gln Gly Met Pro Arg Arg Tyr Ile Asp Tyr Pro Glu Ala
 465 470 475 480
 Phe Ala Leu Trp Asn Lys Val Ser Ser Tyr Gly Ala Phe Leu Ala Phe
 485 490 495
 Ala Ser Phe Leu Phe Phe Ile Val Ile Phe Val Tyr Thr Leu Val Ala
 500 505 510
 Gly Arg Arg Glu Thr Arg Pro Asn Pro Trp Gly Glu Phe Ala Asp Thr
 515 520 525
 Leu Glu Trp Thr Leu Pro Ser Pro Pro Pro Ala His Thr Phe Glu Thr
 530 535 540
 Leu Pro Lys Arg Ser Asp Trp Asp Lys His Pro Ser His
 545 550 555

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 <213> Gluconobacter oxydans

<220>
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 1 5 10 15

atc ggt gcg ttc tcg ctg ccg gtg ctg ttc aaa cag caa gag ttc ccc 9
6

Ile Gly Ala Phe Ser Leu Pro Val Leu Phe Lys Gln Gln Glu Phe Pro
20 25 30

gag ggt gac atc gtc atc aac gtc gag ggt cgt agc
2

13

Glu Gly Asp Ile Val Ile Asn Val Glu Gly Arg Ser
35 40

<210> 4

<211> 44

<212> PRT

<213> Gluconobacter oxydans

<400> 4

Pro Leu Glu Ile Val Trp Thr Ile Val Pro Val Val Ile Leu Val Phe
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Ile Gly Ala Phe Ser Leu Pro Val Leu Phe Lys Gln Gln Glu Phe Pro
20 25 30

Glu Gly Asp Ile Val Ile Asn Val Glu Gly Arg Ser
35 40

<210> 5

<211> 114

<212> DNA

<213> Gluconobacter oxydans

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<221> CDS

<222> (1)..(114)

<400> 5

atc gtc cac ggc gac cgc aag aaa acc gcg att ggc cta gcg att gcc 4
8

Ile Val His Gly Asp Arg Lys Lys Thr Ala Ile Gly Leu Ala Ile Ala

1

5

10

15

atc ggc ctt ggc tgg atc ttt acc ctg tgc caa gcc tat gaa tat tat 9
6

Ile Gly Leu Gly Trp Ile Phe Thr Leu Cys Gln Ala Tyr Glu Tyr Tyr
20 25 30

gaa atc gtc cat acc gaa

4

11

Glu Ile Val His Thr Glu
35

<210> 6

<211> 38

<212> PRT

<213> Gluconobacter oxydans

<400> 6

Ile Val His Gly Asp Arg Lys Lys Thr Ala Ile Gly Leu Ala Ile Ala
1 5 10 15

Ile Gly Leu Gly Trp Ile Phe Thr Leu Cys Gln Ala Tyr Glu Tyr Tyr
20 25 30

Glu Ile Val His Thr Glu
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<210> 7

<211> 87

<212> DNA

<213> Gluconobacter oxydans

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<221> CDS

<222> (1)..(87)

<400> 7

gat tcg atc ttc ctg ctg gtc tgc ctg atc cgc atc ctg cgc ggt gcg 4
8

Asp Ser Ile Phe Leu Leu Val Cys Leu Ile Arg Ile Leu Arg Gly Ala
 1 5 10 15

atg tcg gca aaa cag cac gtc ggt ttc gag atg gcc gca
 7

Met Ser Ala Lys Gln His Val Gly Phe Glu Met Ala Ala
 20 25

<210> 8

<211> 29

<212> PRT

<213> Gluconobacter oxydans

<400> 8

Asp Ser Ile Phe Leu Leu Val Cys Leu Ile Arg Ile Leu Arg Gly Ala
 1 5 10 15

Met Ser Ala Lys Gln His Val Gly Phe Glu Met Ala Ala
 20 25

<210> 9

<211> 6

<212> PRT

<213> Rhodobacter sphaeroides

<400> 9

Trp Phe Phe Gly His Pro
 1 5

<210> 10

<211> 6

<212> PRT

<213> Rhodobacter sphaeroides

<400> 10

Val Trp Ala His His Met
1 5

<210> 11
<211> 16
<212> PRT
<213> Gluconobacter oxydans

<220>
<221> PEPTIDE
<222> (1)..(16)

<400> 11

Lys Asp Ile Gly Leu Leu Tyr Leu Val Ala Ala Gly Val Val Gly Phe
1 5 10 15

<210> 12
<211> 168
<212> DNA
<213> Gluconobacter oxydans

<220>
<221> CDS
<222> (1)..(168)

<400> 12

tgg ttt ttt gga cac ccg gaa gtg tac atc atc att ctg ccc ggc ttt 4
8

Trp Phe Phe Gly His Pro Glu Val Tyr Ile Ile Ile Leu Pro Gly Phe
1 5 10 15

ggc atc atc agc cat gtc gtg tcg acc ttc tcg aaa aag ccg gtc ttc 9
6

Gly Ile Ile Ser His Val Val Ser Thr Phe Ser Lys Lys Pro Val Phe
20 25 30

ggt tac ctg ccg atg gtc tat gca atg ttg gca atc ggt gtt ctg ggc 14

4
Gly Tyr Leu Pro Met Val Tyr Ala Met Leu Ala Ile Gly Val Leu Gly
35 40 45

ttt gtc gtg tgg gcg cac cat atg
8

16

Phe Val Val Trp Ala His His Met
50 55

<210> 13

<211> 56

<212> PRT

<213> Gluconobacter oxydans

<400> 13

Trp Phe Phe Gly His Pro Glu Val Tyr Ile Ile Ile Leu Pro Gly Phe
1 5 10 15
Gly Ile Ile Ser His Val Val Ser Thr Phe Ser Lys Lys Pro Val Phe
20 25 30
Gly Tyr Leu Pro Met Val Tyr Ala Met Leu Ala Ile Gly Val Leu Gly
35 40 45
Phe Val Val Trp Ala His His Met
50 55

<210> 14

<211> 20

<212> PRT

<213> Gluconobacter oxydans

<220>

<221> PEPTIDE

<222> (1)..(20)

<400> 14

Lys Ala Ser Gln Phe Thr His Asn Thr Pro Leu Glu Ile Val Trp Thr
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Ile Val Pro Val

<210> 15
 <211> 6
 <212> PRT
 <213> Gluconobacter oxydans

<400> 15

Gln Phe Thr His Asn Thr
 1 5

<210> 16
 <211> 7
 <212> PRT
 <213> Rhodobacter sphaeroides

<400> 16

Trp Tyr Trp Gly Tyr Glu Tyr

1 5

<210> 17
 <211> 6
 <212> PRT
 <213> Rhodobacter sphaeroides

<400> 17

Thr Trp Ala His His Ala
 1 5

<210> 18
 <211> 7
 <212> PRT

[Signature]

Trp Tyr Trp His Phe Val Asp
1 5

1

5